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the magazine of the Royal Ontario Museum

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Date of Issue: May 1992

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EDITOR'S NOTE

THERE ARE MANY ICONS that are so common that we take them for granted. Yet, as common as they are, we may know little about them. A good example is the Celtic cross. Although most historic monumental crosses are situated in Ireland, freestanding Celtic crosses are readily found in many cemeteries and outside churches in Canada. As Shirley Ann Brown points out in this issue's cover story, the ring circling the cross is not a structural device, and so this distinctive form must have originally had a special, symbolic meaning. The many possible sources of inspiration for the original creation of the ringed cross in the seventh century are fascinating, for they range from the symbols of early Latin Christianity and the Holy Roman Empire to Italian art. Add to that the changing roles the crosses have had through the centuries and the result is an extremely rich history.

On the subject of getting to the source, have you ever wondered when, why, and what animals first evolved? Don Lessem's story about the research of Harvard scholars Andrew Knoll and Nick Butterfield presents the latest theory about the origins of life, 3.8 billion years ago. The theory pushes the appearance of the first animals back many millions of years before the Burgess Shale fauna. Primitive life forms existed on our planet for billions of years, against tremendous odds, until about 750 million years ago when, it seems, a gigantic breath of fresh air brought about some fantastic developments.

Moving on from seeking the origins of the Celtic cross and the beginnings of animal life, have you ever wondered where the ROM's celebrated Chinese lions came from? Records show that in 1922 George Crofts, on behalf of the Museum, purchased the magnificent beasts in Beijing. Beyond that, the history of the lions has been very vague. Some outstanding detective work by Jeannie Parker, archivist for the Museum's Far Eastern Department, may prove that the lions, which have led a very peripatetic existence in the twentieth century, have their origins in the seventeenth century, sculpted for an opulent Manchu palace.

Getting to the source of an ecological problem was the task of Chris Darling of the ROM's Department of Entomology, and his colleagues. When it was discovered that the bluebird population of North America was being ravaged by parasitic blowflies, the scientists found an effective solution through proper research. Previous efforts, by well-intentioned amateurs propelled by sentiment, not science, not only had failed, but had actually exacerbated the problem. The solution lay in an analysis of the relationships between bluebirds, blowflies, and parasitic wasps. As Darling and Julie Thomson-Delaney explain, in this basic example, the role of biodiversity in sustaining life on Earth, you get a sense of the immense challenge of properly researching and analysing the life of the world's rainforests. Failure to do so could lead to more, rather than less, damage to these most complicated of ecosystems.

From Celtic crosses and Chinese stone lions to the origins of animals and the survival of bluebirds and rainforests, we hope you will find your summer issue of *Rotunda*, and your summer, sources of pure enjoyment.

Sandra Shaul

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Ontario's First Fossil Scorpion

A new aquatic scorpion fossil was added to the collection of the ROM's Department of Invertebrate Palaeontology last December through the generosity of Kirby Bransfield and Dianne and Stewart Saxe. The story behind the scorpion's acquisition is as wonderful as the specimen.

In October 1991, Kirby Bransfield, a stonemason, was building a stone wall on the property of Dianne and Stewart Saxe. On one of the blocks he was about to use, he noticed an unusual marking—the outline of a bizarre creature that measured about 9 cm in length. Dianne Saxe brought the stone to the Museum, where the creature was identified as the fossil remains of a large aquatic scorpion that lived approximately 410 million years ago. Although it had been somewhat damaged during its ignominious introduction to the scientific world, the flattened specimen is unmistakable in its form and still retains flakes of original exoskeletal material. Unfortunately the tail with its stinger is missing off the edge of the block.

The find has caused quite a stir at the Museum. Even though the precise source of the stone is not known, Ernie Widmer, the stonework

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contractor, says that it is from a quarry on the Bruce Peninsula, probably the Ross Quarry west of Wiarton, which is managed by Amsen Quarry Ltd. The horizon quarried there is the Eramosa Member of the Amabel Formation, interpreted to be of Middle Silurian age. The yellow-buff laminated limestone splits readily along bedding planes paralleling the original layers of mud that accumulated in a shallow lagoon.

Quarries in the area have produced large eurypterids, which are often referred to as sea scorpions; however, a true scorpion has never been reported from these localities. The oldest true fossil scorpions known from North America have previously come from rocks of the Bertie Formation in western New York state. They have been interpreted as being Late Silurian in age, or slightly younger than the Eramosa Member.

Complete scorpions from New York are small—only about 3 cm in total length, with pincers 0.5 cm long. The Ontario specimen is huge by comparison—about 9 cm long minus its tail, with 3-cm-long pincers. A formidable beast by any standards, it probably represents a new species. It is the first fossil scorpion ever reported from Ontario, the oldest known from Canada, and among the largest of any age in the world.

The fossil scorpion lived and died in an ancient sea and was entombed in the rock for 410 million years before being exposed in the quarry. Only a twist of fate caused the rock to split along the plane containing the fossil. Sheer chance protected it from destruction as it was transported with a truckload of building stones to the Saxe family's property. And a pair of sharp eyes prevented it from being buried once again, perhaps forever.

JANET WADDINGTON
Janet Waddington is a curatorial assistant in the Department of Invertebrate Palaeontology, Royal Ontario Museum

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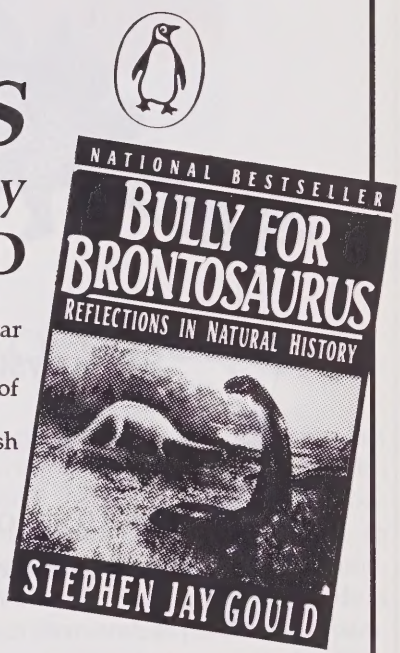

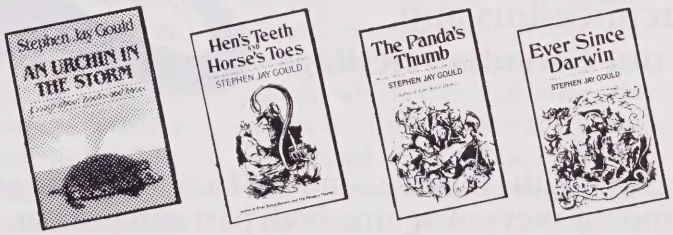

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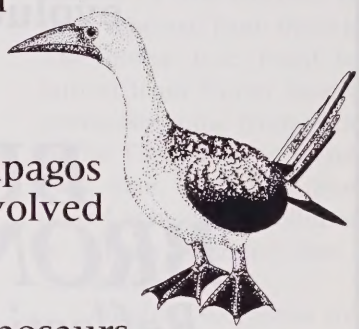

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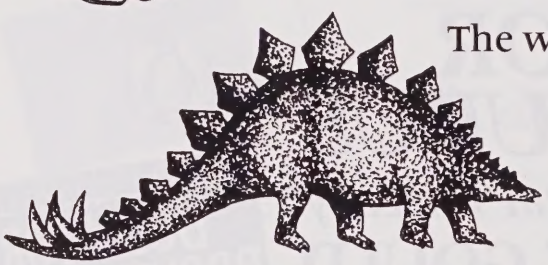

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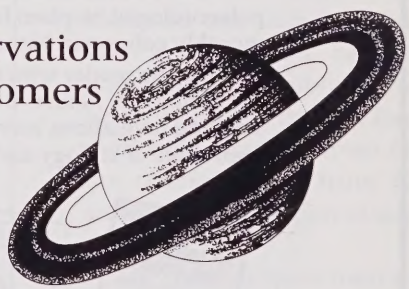

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Parmigiano-Reggiano becomes the classic table cheese when accompanied by ripe fruit and wine.

Parmigiano-Reggiano, the King of Cheese

GRATED PARMESAN CHEESE, DRESSED in all the popular brand names, abounds on grocery store shelves, ready to be added to Caesar salad or minestrone or pasta at the shake of a wrist. If you like the commercial imitation of one of the world's greatest cheeses, then you should try the real thing, Parmigiano-Reggiano, which in literal translation means "cheese from Parma and Reggio." There is just no comparison in aroma and taste: authentic Parmigiano-Reggiano, produced for more than seven hundred years in the Emilia-Romagna region of northwestern Italy, may be copied but never matched.

The earliest written record of Parmigiano-Reggiano dates back to 1300, although its production certainly predates that era. Boccaccio referred to Parmigiano in the *Decameron* when he described Paradise as having "a mountain consisting entirely of grated Parmigiano cheese, on which live people who do nothing but cook macaroni and ravioli, which they roll down the slopes so that it arrives at the bottom coated with fragrant cheese." I wish I were gullible enough to believe that. In reality, Parmigiano-Reggiano continues to be produced in Italy in its own legally defined region, which includes the entire provinces of Parma, Reggio Emilia, and Modena, as well as portions of the cities of Mantua and Bologna, and the cheese must be made according to rigorous standards established by law.

Having been reared on Canadian cheddar as a result of having two uncles who were qualified cheesemakers, I found that a visit to a Parmigiano-Reggiano cheese dairy last spring brought back many childhood memories. I was also convinced that it is not unpatriotic to love two cheeses at the same time. The Emilia-Romagna countryside is rich farmland, as placid as the pampered cows that provide the first-class raw material to the small, sparkling-clean cheese dairies. The air smells of blossoming fruit trees and natural fertilizer, a partial paradise. From such an environment comes a wholly natural food, highly nutritious, easily digested, and containing the lowest fat and cholesterol of all aged cheeses.

It takes about eight litres of milk to make approximately 454 grams of cheese, which gives Parmigiano-Reggiano a very high protein content. The milk collected from individual farms is kept separate, as with

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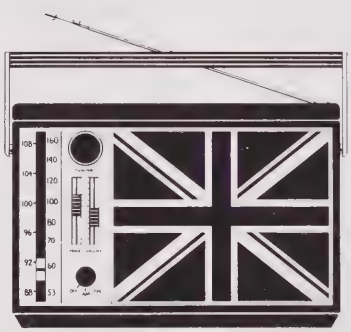

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single vineyard wines, but morning milk and evening milk are mixed together in large copper or stainless steel cauldrons shaped like upturned bells. Milk enzymes are added which, by increasing the milk acidity level, are indispensable for the correct fermentation of the cheese. The milk is then heated, and rennet (a natural extract from the stomach of calves) is added to make it coagulate.

The coagulated milk, or curds, is turned over and broken up into pieces the size of kernels of corn, and the whole mass is cooked, first slowly at 45° Celsius, then at an increased temperature up to 55° Celsius. Once the heat is turned off, the compact mass of curds at the bottom of the vat is removed with a wooden paddle and wrapped in cloth. The leftover liquid, or whey, is fed to pampered pigs destined to become the famous ham of Parma—but that is another delicious story.

After being pressed into a mould or *fascera* that gives the cheese its characteristic shape, the cheesecloth is removed and a special die is passed between the cheese and the mould, which stencils the Parmigiano-Reggiano stamp on the fresh rind. Having set in its final shape, the cheese is then immersed in a kitchen-salt brine for a period of 20 to 25 days.

Following a brief exposure to the sun, the cheese is ready to go to the *cascina*, or storehouse, where the long, natural maturing will begin. During the ageing period, from 18 months to two years, the cheeses are regularly turned and checked. An expert from the Parmigiano-Reggiano Consortium carries out the periodic tests and only suitable cheeses receive the stamp of approval, an oval mark branded on the side, guaranteeing authenticity but not complete conformity of taste. As with wine, each cheese has its own character that is influenced by the raw material, the length of maturation, and the skill of the individual cheesemaker.

The nutritional value of Parmigiano-Reggiano is greatly affected by the maturation process. Long ageing lessens acidity and breaks down the proteins, making the cheese easy to assimilate into the digestive system. It also contains far more minerals and vitamins than most other sources of animal protein, so it is an excellent substitute for meat.

Although it is the classic table cheese accompanied by a ripe pear, apple, peach, or grapes, and some wine, of course, it is also perfect in any recipe calling for a gratinéed crust. It is superior for this purpose because it melts without degenerating into long rubbery threads that wrap themselves around your fork and chin (Think of French onion soup). Vegetables sprinkled with Parmigiano-Reggiano take on instant gourmet status. One of my favourite supper dishes is a baked potato dressed with extra virgin olive oil, ground black pepper, and freshly grated Parmigiano-Reggiano. A diet salad is made less bleak by adding a few slivers of Parmigiano atop greens and mushrooms. And all of the cheese can be used. Even the rind becomes edible when cooked up in a pot of homemade vegetable soup, where it is softened by the heat so that it can be cut into small pieces to enrich each serving.

When buying this cheese, always look for the name Parmigiano-Reggiano on the rind, a guarantee of authenticity. It is best to buy the cheese by the wedge and grate it at home as needed, because pre-grated cheese, like pre-ground coffee, loses flavour and aroma quickly. Store Parmigiano-Reggiano in several layers of plastic wrap in the refrigerator but bring it to room temperature before serving. Then enjoy eating it by itself, as an accompaniment to fruits and vegetables, or in one of the following delicious recipes.

Tortellini Appetizer

Ingredients

- Meat- or spinach-filled tortellini
- Extra virgin olive oil
- Red pepper flakes or hot pepper sauce

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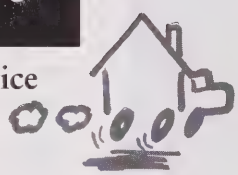

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• Parmigiano-Reggiano, freshly grated

Method

• Cook tortellini and drain well. While still hot, roll in a little olive oil and sprinkle with hot red pepper flakes or hot pepper sauce. Let cool and set aside, covered. Before serving, roll tortellini in Parmigiano-Reggiano and serve with small skewers or toothpicks.

Oysters Belyea

• To opened oysters add a sprinkle of crushed, crisp bacon, finely diced onion, freshly grated Parmigiano-Reggiano, and a very small dash of Worcestershire or Tabasco sauce. Broil until hot.

Scarpaccia (Zucchini Pie)

Ingredients

• 454 gm small zucchini, finely chopped
• Salt
• 2 large eggs
• 60 mL sifted flour
• 156 mL mixture of milk and water (half and half)
• 1 or 2 bunches green onions, finely chopped
• 125 mL Parmigiano-Reggiano, freshly grated, plus extra for garnish
• 1 clove garlic (or more to taste), finely chopped
• White pepper to taste
• 65 mL olive oil

Method

• Salt zucchini and allow it to drain in a colander for 20 minutes. In the meantime, beat together the eggs, flour, and the milk/water mixture to form a smooth batter. Rinse the zucchini and pat dry. Mix the zucchini, onions, cheese, garlic, and pepper into the batter, and pour the batter into a greased baking dish.
• Drizzle olive oil on top and bake in a preheated oven at 425°F until set and golden (about 30 minutes).
• Serve with extra grated Parmigiano-Reggiano. Even diehard zucchini-haters will ask for seconds.

Geraldine Rubino
Geraldine Rubino is a food and wine writer living in Toronto

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In Search of the Su Wang Fu

What was the original home of the ROM's celebrated Chinese lions?

Jeannie Parker

In the summer of 1988, in an atmosphere of great excitement (and some trepidation in view of their enormous weight), the Royal Ontario Museum's great seventeenth-century Chinese stone lions were once again on the move. When they first arrived at the Museum in 1923 they were put on display in the former Exhibition Hall. Later they were moved out into the garden with the Chinese Tomb. Later still they were brought back inside and placed at the entrance to the new Chinese galleries. In their latest move, they were slowly and carefully pulled on huge sledges through the galleries and out onto the terrace. There they were hitched to a block-and-tackle, swung through the air by an enormous crane, and carefully lowered onto their bases, located in the Museum garden facing Bloor Street. Hopefully this was the last time the lions would have to move, for these restless beasts have led a rather peripatetic existence throughout much of the twentieth century.

In a letter dated 4 February 1921, George Crofts, a British fur trader based in Tianjin, suggested to C. T. Currelly, the first curator of the Royal Ontario Museum of Archaeology, that the Museum acquire a pair of stone guardian lions, or "Kylins" as he called them, to complete the Museum's marvellous collection of Chinese stone sculpture. Apparently Currelly agreed, and Crofts began a search that culminated in July 1922 with the purchase of this impressive pair, which he had found in Beijing. By October of that year the lions had reached Crofts in Tianjin.

On 20 October, full of enthusiasm, Crofts wrote Currelly to say,

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Jeannie Parker is the archivist of the Far Eastern Department, Royal Ontario Museum

I have just returned after inspecting the Kylins and can assure you that they are wonderful and beautiful.... Wonderful because of their tremendous size and beautiful because of their posture and the decoration on the body and the base.

It is easy to imagine the sensation they created as they moved at a stately pace through the city of Tianjin from the railway station to Crofts's office compound, which was located in the French Concession. The difficulties involved are reflected in a letter, also dated 20 October, from Crofts to the Chief of Police, French Municipal Council, Tianjin, that says:

At the moment, we have at the corner of Rue Henri Bourgeoise, a Stone animal, which the police do not wish us to take over the tramway lines without your permission. As our office and compound is across from this street and it is necessary for us to cross the tramway lines, kindly instruct the police to permit the animal to cross, as we do not think the weight would damage the lines.... Your prompt attention would be appreciated.

The ROM's celebrated Chinese guardian lions once stood in front of the Austro-Hungarian legation in Beijing.

COURTESY FAR EASTERN DEPARTMENT ARCHIVES, ROM

Finally the lions reached Crofts's compound where they were to remain throughout the winter of 1922-23 while their packing cases were being built.

Building the cases was a much more arduous task than you may imagine, because in China wood for carpentry is sold in the form of trees. Nonetheless, in March 1923 the finished cases containing the huge stone animals were loaded on the *West Jenna* bound for Portland, Oregon. From there they were trans-shipped to New York via the *Panaman*, which docked in May, and then they were sent by rail to Toronto. Although the lions' journey from the time they arrived in Tianjin until they reached the Museum was fully documented, the question of their origins still remained.

AFTER BEING PURCHASED IN Beijing the lions were removed by great carts through the streets, to the railway station where they were loaded onto flatcars for their journey to Tianjin. As would happen in Tianjin, such a move created quite a stir. Crofts described this scene in his letter of 20 October 1922:

These are probably the largest Kylins in China and my Chinese inform me that dozens of people in Peking have taken snapshots as the goods were being dragged to the Railway Station, a distance probably of one mile and the cost has been $150, plus sundries, so that whole question is going to be expensive.... I must state, however, that whatever the cost the Kylins are worth it. They are the

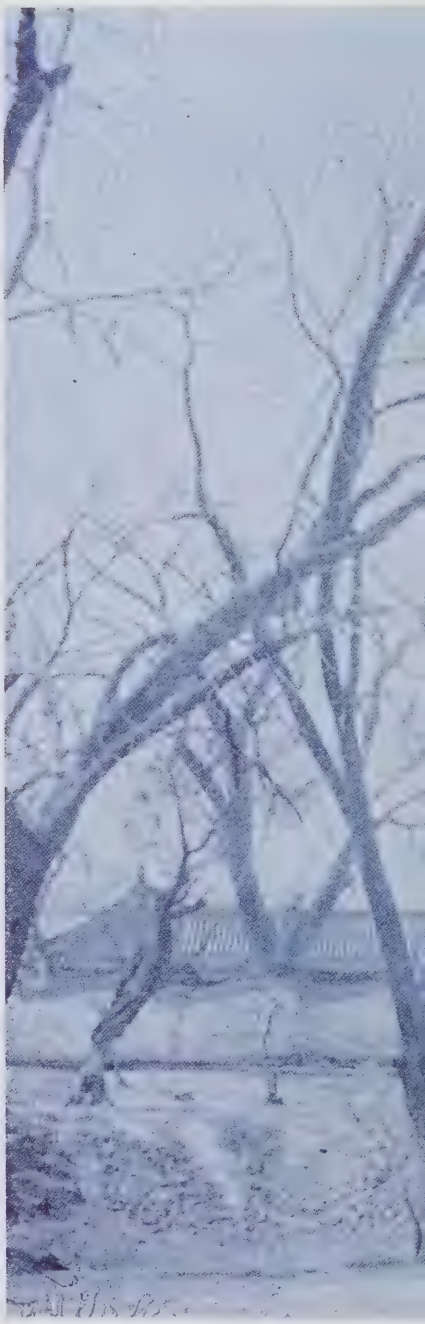
finest I have ever seen, and the greatest for size, beauty and form, ever sent from China.

This is high praise indeed from a man who was a great connoisseur of Chinese art and the most important early patron of the ROM's Chinese collections.

According to Crofts, the lions came from the Austro-Hungarian legation in Beijing. By means of photos in the Far Eastern Department Archives their journey can be traced backwards from the Beijing railway station to a site in front of a large foreign-style building. But was this in fact the legation of the Austro-Hungarian Empire from which Crofts purchased the lions?

The building had a rather modern appearance for a legation that had been established decades before. However, it was possible that the old embassy had been destroyed in the siege of the legations during the Boxer Rebellion of 1900 and that a new one had been built later. I began to look through records of the rebellion and found that this was the case. The old Austrian legation, situated in the northeast corner of the legation quarter, had been

A portrait of Shangi, the Prince Su, who played an important political role during the last years of the Qing Dynasty.



destroyed during the opening hours of the conflict. At this point, however, I still had to confirm that the building in the archival photo was indeed the new Austrian legation, and if possible to find out where it was located.

I wrote to the Austrian State Archives in Vienna, requesting any information available on the stone lions. The archivists very kindly sent letters and maps that confirmed that the building in the photo was the new legation building, which was built, after the rebellion, on the same site as before, but now considerably expanded. They also provided a copy of the plans of the new legation compound, which enabled me to establish the exact location of the lions in the garden in front of the embassy. The odd fact that the lions were placed there, rather than flanking the main southern entrance as was the usual Chinese custom, was also accounted for by an invoice of 1904, which mentions that two stone lions at the gate of the legation had been moved. The Austrians must therefore have acquired them sometime before 1904. But how?

According to Currelly (who presumably

The Su Wang Fu, palace of the Prince Su, was at the centre of the legation quarter in Beijing.

PHOTOGRAPHY FROM *CHINA IN CONVULSION*, 1901

received the information directly from Crofts), during the Boxer Rebellion an Italian contingent decided to appropriate the lions, which they had found in Beijing, and drag them away. But when they were not very far outside the city, they found the lions too heavy and abandoned them. The Austrian legation then had them brought back and installed, presumably at the gate.

The Austrian State Archives also provided an explanation as to why the Austrians might have sold these splendid lions to George Crofts in 1922. Diplomatic relations between the Austro-Hungarian Empire and China were severed during the First World War, China having declared war on Germany and Austria in 1917 in order to take over their assets. The Dutch embassy handled the auction and sale of the inventory of the Austrian embassy sometime after the war. Yet in the documents concerning these transactions no reference to the lions was made. Thus it would appear that Crofts purchased them prior to the auction.

There still remained the question of the lions' location before they were dragged off by the Italians. The custom of using pairs of stone lions to guard the entrances of temples and palaces has a long history in China, and if, as Crofts says, the ROM lions were the largest and most beautiful that he had ever seen, then they must have originally guarded some magnificent architectural complex. Furthermore, because this pair is dated stylistically to the seventeenth century, it stands to reason that they were carved to grace a Chinese mansion or temple long before foreign legations were established in Beijing. Fortunately Crofts provided a clue to this mystery in another letter in which he wrote, "They were formerly in front of Prince Su's Palace in Peking: this being a close relative of the late Manchu dynasty therefore of high rank and nobility."

With this information in mind I decided to try to track down Prince Su. Unfortunately, in his reference to the prince, Crofts did not use Chinese characters, which might have provided a clue to the prince's identity, although he did leave the impression that everyone should be familiar with Prince Su. I decided to look for a prince of this name who might have been active during the period of Crofts's residence in China.

In a letter to Currelly dated 1921, Crofts stated that by that time he had been shipping antiques for 25 years, which would mean that he had begun this activity around 1896. However, this was just a delightful hobby for him; his real work as a fur trader must have started earlier. By

The Chinese guardian lions were pulled through the streets of Beijing to the railway station for shipment to George Crofts in Tianjin.

looking again at events leading up to the Boxer Rebellion of 1900, I discovered that a Prince Su, Shanqi, a powerful nobleman fiercely loyal to the Manchu throne, had played an important political role during the last years of the Qing dynasty.

By a strange and wonderful coincidence, the grand and stately palace complex of this Manchu prince was located in the heart of the old legation quarter of Beijing, and was the scene of some of the fiercest fighting during the siege of the legations, the culmination of the Boxer Rebellion. In the accounts of the period the palace is always referred to as the Fu, but its full name was the Su Wang Fu, meaning the palace of Prince Su. (The street in modern Beijing called Wangfujing, or Princes' Palace Street, is a reminder that many of the most opulent noble houses were originally located in this area southeast of the Imperial City.)

The Su Wang Fu must have been one of the largest and most impressive in Beijing, for it is described as a rambling 14-acre estate dotted with pavilions, pagodas, stables, servants' quarters, gardens, and ornamental knolls. The palace was built in typical north Chinese fashion on a north-south axis with the entrance at the southern end, and was arranged around three great courtyards in the manner restricted by law to those of princely status. To the west were the great and elegant gardens of the Fu graced with artificial ponds and pavilions, and the whole palatial park was completely hidden from view by a high wall. A splendid photograph in the *Illustrated London News* of 1900 shows a view of the Su Wang Fu from across the Imperial Canal, which separated it from the British legation at that time.

From accounts of the siege it is known that the Su Wang Fu played a crucial role in the defence of the legations. On 14 June 1900, acting on reports that Boxers had taken refuge in the Fu and were using it as a drill-ground, the British minister asked to make a military inspection of the premises. Prince Su indignantly refused at first, but soon yielded to pressure and cordially conducted the inspecting delegation on a tour of the whole place. As the result of subsequent negotiations, arrangements were made to house temporarily, in the outer courts of the Fu, more than 1500 Chinese Catholics who had been rescued from the Southern Cathedral (Nan Tang). By 20 June they had arrived and begun to settle in. At this point the Boxers opened hostilities by attacking the Austrian legation, and "Prince Su prudently retired to the security

COURTESY FAR EASTERN DEPARTMENT ARCHIVES, ROM

of the Imperial City."

During the siege, the Fu was defended by the Japanese under the command of their military attaché, Colonel Shiba, who by all accounts was the ablest and most experienced officer of any nationality present. A small contingent of Italians, who had to abandon their own legation, also aided in the defence. One of the most urgent needs was for sandbags, and one account describes how "the sewing machines whirred as the ladies went to work. They used very diverse materials —Lady MacDonald's best curtains, the exquisite silks and satins of Prince Su's concubines, the legs of old trousers —and the barricades grew in beauty as well as strength."

Did the ROM's magnificent pair of stone lions once guard the majestic seventeenth-century Su family palace in Beijing? And if this is their origin, was it coincidence or fate that these guardians of the imperial Su family would be sold and shipped from China only a short while after the death of the last Prince Su?

Hundreds of frightened Chinese, who took refuge in the Fu, proved essential to the defence of the legations, providing labour for the construction of the fortifications and serving as messengers and spies. However their living conditions were absolutely appalling, and there are descriptions of women flapping weakly at the flies that settled on dying babies as the siege took its toll.

When the firing had finally stopped and the smoke had cleared, much of the old legation quarter lay in ruins. The shelling and the resulting fires had utterly destroyed the beautiful Su Wang Fu. Nothing was left standing except a few broken walls and, perhaps, the pair of stone lions which, according to Chinese tradition, guarded the main southern entrance. These lions would have been carved on a massive scale to match the splendour of the princely residence, and, judging by the existing evidence, I believe that the ROM's magnificent seventeenth-century lions are those very lions.

Such stone guardian lions were often erroneously called "fu dogs" by Westerners in China. In Chinese they are called *shizi* (lions) or *shishi* (stone lions). I had always assumed that the word *fu* came from *fo* meaning "Buddha," a reference to the early appearance of lions in China as Buddhist guardian animals; but now I realize that it could just as well have come from the word fu meaning "palace."

On a rare old map of Beijing in the Far Eastern collection, the Su Wang Fu is described as the Su Qin Wang Fu, which indicates that the Prince Su was a direct descendant of the Imperial family, rather than a member of a peripheral branch. This is extremely important in dating the lions, because it means that the land may have been granted and the palace constructed soon after the Manchus had captured Beijing in 1644. This assumption is supported by the fact that the lions are carved in the Tibetan style, which became popular at the Qing court soon after the founding of the dynasty. The fact that Prince Su was of the royal line would also suggest that his family owned the Fu throughout the succeeding 250 years.

In the treaty that was signed after the Boxer Rebellion, the legation quarter was set aside for the exclusive use of the foreign powers, and the area of the Su Wang Fu was put under the control of the Japanese who had fought so valiantly in its defence. It is possible that somewhere among Japanese records of the siege some mention of the lions may yet be found. However, with the arrival of foreign troops and the lifting of the siege of the legations, a wave of lawlessness and looting swept over Beijing. And it was during this chaotic time, if Currelly is correct, that the Italians absconded with the lions.

At this point I cannot confirm my hypothesis that the Royal Ontario Museum lions came from the Su Wang Fu. But, as with all archival investigations, the search goes on, and perhaps someday I may find irrefutable evidence in the form of a picture or a description.

When the Qing dynasty finally fell in 1911, Prince Su went into exile, vowing that if he ever returned, it would only be when the Dragon flag flew once more over the gates of Beijing. This was not to be, however, and according to the Qing histories, Shanqi was the last of his family to hold the title Prince Su. He did return to Beijing eventually in April 1922, but in his coffin. And only a few months later, in July 1922, Crofts purchased the lions from the Austrians. Perhaps this was just a coincidence, perhaps not. Who knows?

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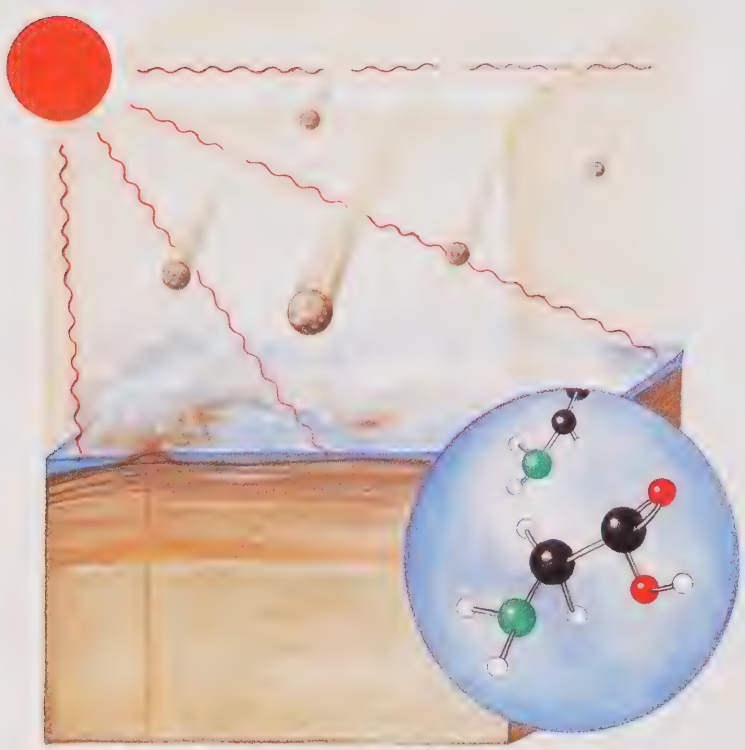
JUST A BREATH

Scientists think animal life began with a big breath of fresh air

"ORIGINS ARE THE NEAT STUFF OF EVOLUTION," SAYS KEVIN PADIAN, University of California palaeontologist. Harvard University palaeobotanist Andrew Knoll and his graduate student, Nicholas Butterfield, agree. Don't speak to Knoll and Butterfield of asteroids, dead dinosaurs, and catastrophic extinctions. Rather, let them tell you about how we got here—how animal life began. And why.

For, in elegant and unprecedented detail, Andy Knoll has been piecing together the puzzle of the proliferation of animal life. It all appears to have something to do with a breath of fresh air. In search of answers to age-old questions, Knoll and Butterfield will both take you way back, to times and places long before the bizarre creatures of the Burgess Shale, (520 million years ago, in the Cambrian era). "All the real answers lie before the earliest Cambrian," says Butterfield. "Life was well in place by then."

The Earth is thought to be 4.5 billion years old, yet life most likely did not begin before 3.8 billion years ago. That is because the Earth was an inhospitable place. The sun shone less brightly, there was no oxygen, and there was no ozone layer to screen out cosmic radiation. Any life that did evolve would have been hammered by falling meteorites and snuffed out on a regular basis.



4.5 BILLION YEARS AGO

The Precambrian has never gotten much ink. By contrast, the Burgess Shale's wonderfully preserved soft-bodied sea creatures are now the best-known of early animals. That knowledge is in large measure due to the continuing research on the Burgess Shale by Dr. Desmond Collins of the Royal Ontario Museum at the quarry site in Yoho National Park, and to the earlier studies by Dr. Harry Whittington of Cambridge University and his former students. The celebrity of the Burgess Shale fauna and its reputed role as the most important evidence of an evolutionary explosion, have been greatly enhanced by the writings of Knoll's downstairs neighbour at work, Stephen Jay Gould, a palaeontologist at Harvard's Museum of Comparative Zoology.

Until lately supplanted by earlier Cambrian finds in Greenland and China, the Burgess Shale fossils were the earliest soft-bodied animals known on Earth. They remain prime evidence for the "Cambrian explosion" of life-forms. The origin of animal life, however, has long been thought to lie even deeper in time. The Burgess Shale's early twentieth-century discoverer, Charles Doolittle Walcott, secretary of the Smithsonian Institution, imagined that its animals must have had near ancestors back in the Precambrian (what he called the Lipalian Interval). And Darwin speculated, back in 1859, that the late Precambrian seas must have "swarmed with living creatures."

The evidence for metazoan (multi-cellular) Precambrian life was un-

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Don Lessem is a journalist and author based in Boston. His latest book, Kings of Creation, *published by Simon & Schuster, is about dinosaur discoveries worldwide.*

OF FRESH AIR

BY DON LESSEM WITH ILLUSTRATIONS BY KAREN VISSER

known to Darwin. Walcott searched for Precambrian fossils, and found them in 1898, but little was made of them or of a host of subsequent discoveries until the middle of this century. Even then, there was scientific resistance to pushing the age of multi-cellular life far back in time. The "great whistleblower," as Butterfield calls him, on claims of Precambrian metazoan life, was geologist Preston Cloud from the University of California at Santa Barbara. "The putative fossils usually turned out to be sedimentary structures, not metazoans," says Butterfield. But not always. Fossils of soft-bodied marine creatures were discovered from rock formations worldwide, including the Northwest Territories, the Yukon, and Newfoundland, and all are approximately 580 million years old (some 30 million years before the boundary of the Precambrian and Cambrian, which is defined by the first appearance of diverse small shelly fossils).

These simple creatures took on shapes reminiscent of pancakes, fern fronds, and flattened worms. Many were relatives of present-day jellyfishes. They are known collectively as the Ediacaran fauna, named for the dramatically sculpted Ediacara Hills of South Australia, where the best-known specimens were found.

For nearly thirty years texts about the Earth's history had taught that multi-cellular animal life began with the Ediacaran fauna. That's what Andy Knoll, now in his early 40s, learned while growing up and attending college in Pennsylvania. And that is what Nick Butterfield was taught a decade ago, after the Lethbridge-area high-school drop-out gave up his work as a truck mechanic and decided to get an education. "I read Lucy (by primate anthropologist Donald Johanson) and decided to be a palaeoanthropologist. But I soon saw I had to start the story hundreds of millions of years earlier."

Butterfield has been looking back ever since. Like his mentor, Knoll, Butterfield is a small man with poor eyesight though great vision. But while Butterfield is exuberantly outspoken, Knoll is quietly scholarly. Both are looking hard and farther back than many have searched in the past, for early markings on the trail of life.

To begin at the very beginning, the Earth is now thought to be about 4.5 billion years old. For a long time, it was not a hospitable place. The sun may have been only about half as luminous as it is now. There was no oxygen, and there was no ozone layer to screen out cosmic radiation. The Earth, like its moon, was pelted regularly with debris from an active young solar system. "If there was any life before 3.8 million years ago," says Butterfield, "chances are it was hammered by meteorites and

The earliest evidence of life are microfossils. Microfossils of such organisms as the stromatolites and microfilaments pictured here, were found in Australia and South Africa and date back 3.5 billion years. The organisms had lived in the shallow waters of tidal flats. The oldest sedimentary rock on Earth, the Isua Supracrustal Belt of western Greenland, is only 3.75 billion years old, and so no fossil evidence of life from earlier times could exist. Furthermore, temperature and pressure changes have altered the rock so much that the remains of any contemporary life would have been destroyed. However, there is evidence of possible organic activity, and therefore, the suggestion of life earlier than 3.5 billion years ago.

3.5 BILLION YEARS AGO

ANDY KNOLL THINKS HE KNOWS WHY, ONCE THE EMERGE FOR ANOTHER 3 BILLION YEARS. THE REASONS FOR

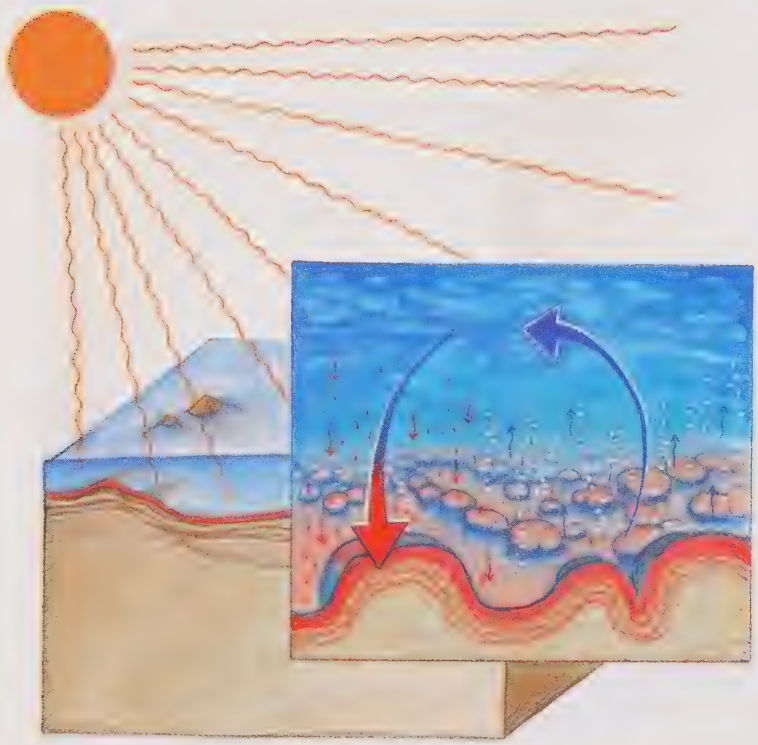
snuffed out on a regular basis."

Perhaps there was life then, but there is no evidence. That's because the oldest sedimentary rock, the Isua Supracrustal Belt of western Greenland, is but 3.75 billion years old. Temperature and pressure changes have altered these rocks so much that no fossils could be preserved, but there is a clue to suggest that the Earth hosted life nearly four billion years ago.

Organic activity makes preferential use of the lighter of the two common isotopes of carbon. Measurements of the two isotopes in the Isua rock show a concentration of the light isotope—what one would expect from a world with life. More certain evidence of early life, in the form of microfossils, was found by Australian geologists examining rocks not much younger—3.5 billion years old. Andy Knoll himself has found similar material in South Africa.

Palaeontologist Elso Barghoorn, the late Harvard guru of Precambrian life, had previously pushed estimates of the presence of life on Earth back to at least two billion years ago by finding microfossils—what Butterfield calls "little sticks and balls that are clearly biological"—in the Gunflint Iron Formation east of Thunder Bay, Ontario. Stanley Tyler, a Wisconsin geologist, invited Barghoorn to the site because he suspected that black chert was the rock type in which Precambrian microfossils could be found.

Elso Barghoorn had found microfossils dating back at least 2 billion years in the Gunflint Iron Formation east of Thunder Bay. These fossils, and those that are older, represent prokaryotic life—single-cell organisms that existed long before the evolution of those with nuclei or those that breathed oxygen. Oxygen, released by photosynthesis of blue-green algae, combined with dissolved iron to form rust, which was deposited in formations from about 4 to 2 billion years ago. The oxygen combined with the iron as quickly as it was generated by the blue-green algae. Oxygen-breathing organisms could not evolve until the process of deposition ceased.



2 BILLION YEARS AGO

The microfossils were the remains of organisms that lived billions of years before the Ediacaran fauna, and a lot of change would have to have taken place before the level of evolution represented by the Ediacaran fauna. Rather, they were simple prokaryotic organisms, not what Gould calls, in his *Wonderful Life*, "the complex textbook variety (of cells) complete with nucleus and numerous structures and cytoplasm." Those textbook cells are eukaryotes and they show up much later than 3.5 billion years ago, although their time came considerably earlier than scientists had thought. Research on the eukaryotes is being conducted by Knoll and Butterfield, as well as by a team led by Bill Schopf, another student of Barghoorn, now teaching at UCLA.

Signs of eukaryotic life, in the form of cysts made only by cells with nuclei, have been identified from rocks 1.7 billion years old. Butterfield's quest for early life has taken him north to Somerset Island, near Baffin Island. There, in rocks close to one billion years old, he's found remains of eukaryotic red algae, almost big enough to be visible to the naked eye.

BASIC BLUE-PRINT OF LIFE WAS DRAWN, ANIMALS DID NOT
THE LONG EVOLUTION OF LARGE ANIMALS ARE STILL UNCLEAR

Among Knoll's research projects of the last decade is the surveying of the glaciated mountains of Spitsbergen, midway between the north coast of Norway and the North Pole. This desolate land reveals more than 6100 metres (20,000 feet) of sedimentary rocks formed in shallow oceans from approximately 850 million to 600 million years ago. Within them are a wealth of fossils—prokaryotes indistinguishable from modern cyanobacteria, and eukaryotes. And these, to even Knoll's surprise, include multi-cellular life, as Butterfield has shown him.

Knoll "looked the stuff over and found nothing multi-cellular," recalls Butterfield. However, Butterfield employed an uncommon process in which he carefully examined fine-grained shale in thin sections and used a delicate acid maceration to isolate the fossils. Butterfield is reluctant to say much about these organisms as he's not yet published his findings. Yet, here, in rocks 750 million to 800 million years old, are what Butterfield believes were organisms, showing a degree of organization approaching that of metazoan life (see page 48). If Butterfield is right, a level of organization of life not thought to exist before the Ediacaran fauna had been attained 150 million years earlier.

The timing of Knoll's and Butterfield's finds from Spitsbergen to the Canadian Arctic is in harmony with molecular measurements that peg the first animals at 800 to 1000 million years ago. "Clearly," says Butterfield, the "explanation for the Cambrian explosion of life lies in the Precambrian. My interest is to break that history into a meaningful sequence of evolutionary change."

That same interest has led Knoll to delve into the causes for what is still a formidable hiatus in the evolution of life. Why—once the basic blue-print of life was drawn—did animals not emerge for more than three billion years? That is the question Knoll asked and answered thoroughly in the *Scientific American* magazine of October 1991. A second, related question is: Why were there no large (as in macroscopic or close to it) animals prior to the Ediacaran creatures?

In a word, the answer to both questions is oxygen. And it's not just Knoll's answer but that of many scientists, beginning more than three decades ago with Ralph Nursall, a University of Alberta zoologist. Nursall suggested that there may be a threshold oxygen level necessary for animals to develop. Plants need less oxygen than animals to survive—indeed, they are net producers of oxygen. Oxygen levels were too low, the theory goes, before the development of multi-celled Ediacaran animals, to allow for a diversification of animal life. The instigator of this theory was none other than Preston Cloud.

Signs of eukaryotic life—single-celled organisms that have nuclei, numerous structures, cytoplasm, and that breathe oxygen—have been found in rocks as old as 1.7 billion years. From this evidence it appears that after prokaryotic life evolved it took about 2 billion years for eukaryotic life to appear.

1.7 BILLION YEARS AGO

THE AVAILABILITY OF OXYGEN SEEMS TO HAVE ANIMAL LIFE. IT HAS TAKEN DECADES OF GEOLOGICAL AND

In the mountains of Spitsbergen, there are sedimentary rocks that were formed in shallow oceans from approximately 850 million to 600 million years ago. Within them are a wealth of fossils—prokaryotes indistinguishable from modern cyanobacteria, and eukaryotes. Small fossils, which may be affiliated with metazoan (multi-cellular animal) life, were found in rocks 750 million to 800 million years old. If not actually metazoans, the fossils may represent a level of organization of life not previously thought to exist before the Ediacaran fauna, attained 150 million years earlier.

800 - 750 MILLION YEARS AGO

But it has taken decades of research, by Knoll and others, to find the geological and biochemical evidence to support this notion. As Knoll says, "to me the origin of animals is nested in a much greater set of biochemical questions."

For one, just what is the critical oxygen level? Oxygen levels on modern-day Earth are in the range of 20 per cent of the atmosphere. Texas scientists, in 1965, established 0.2 per cent of the atmosphere, or one per cent of today's level, as a critical threshold for aerobic metabolism and the accumulation of stratospheric ozone sufficient to block deadly ultraviolet rays.

Subsequent research has indicated that this oxygen level was reached nearly two billion years ago. But macroscopic animals needed a lot more oxygen. A UCLA researcher, Bruce Runnegar, estimates that Ediacaran-type animals would have needed more like six to 10 per cent of present-day oxygen levels to survive. But, as Knoll points out, this estimate only holds if the Ediacaran creaures had well-developed circulatory systems. If, as is more likely, they had systems no better than simple diffusion for getting oxygen to their tissues, they would have needed oxygen levels more like today's.

Perhaps, to get the minimum oxygen necessary for life, they could not change from the simple ribbon or pancake shapes, which maximized their surface area in relation to their volume. For billions of years the Earth offered very little oxygen to its residents. The most significant evidence for this low-oxygen world comes from banded iron formations.

Clearly marked with brillant red to black stripes, some extremely thick and others as thin as one millimetre, the formations can be seen on the north shore of Lake Superior and in a host of other early Precambrian basins worldwide. These formations contain 80 per cent of the world's iron reserves and include some of the oldest sedimentary rocks on Earth. They were deposited for close to two billion years, until about two billion years ago. The iron formations were formed by the combination of oxygen with dissolved iron, which produced insoluble iron oxide (rust) that was deposited. Oxygen was removed from the Earth's oceans by the iron oxide as fast as it was generated through photosynthesis by blue-green algae. After the deposition of bands of iron ceased, free oxygen began to accumulate. Organisms then began to use the oxygen in their life processes.

The way that free oxygen levels were further increased was through the burial of once-living things. Dead and buried before they decayed,

BEEN FUNDAMENTAL FOR THE EMERGENCE OF
BIOCHEMICAL RESEARCH TO FIND SUPPORT FOR THIS CONCLUSION

they couldn't be oxidized and the free oxygen in the atmosphere was not entirely consumed. For carbon to be buried faster than it could be oxidized (i.e., decay) required a world of intense geologic activity. And as geological evidence is now suggesting, that was the state of things 850 to 600 million years B.P. The world was literally coming apart. A supercontinent was breaking up. Mountains were shooting up in Africa. Hot water was bursting from the sea floor.

Direct measurement of the rate of carbon burial caused by all this rearrangement of the Earth's surface isn't easy to carry out. But it can be estimated, by a method similar to that applied to the 3.75 billion-year-old Isua rock, from the ratio of the light carbon isotope to its heavier common variety. Knoll and his associates at Indiana University studied carbon-isotope ratios in the nearly 850-million- to 600-million-year-old Spitsbergen sediments, noting the changes through time sequences.

Through that period, organic carbon was being buried at some of the highest rates noted for the past two billion years. But carbon isotope ratios, and by inference oxygen levels, fluctuated greatly, dipping down to previously normal levels for relatively short periods. Findings from other continents confirmed that what Knoll interpreted for Spitsbergen was part of a global phenomenon.

There were other clues to what was peculiar about the world when animal life first appeared. Banded iron formations, which were previously deposited in a low-oxygen world, had formed again after no such activity for more than one billion years. This time they showed up together with tillites, rocks consolidated from debris that had been eroded and moved by glaciers. There hadn't been a major ice age on Earth for 1.5 billion years, but at least two and maybe four of them swept over the Earth 850 to 600 million years B.P. The last was the most extensive glaciation of all time. It is possible that the ice sheet came within 10 degrees of the equator, nearly blanketing the entire planet in ice.

The ice may have been produced by a kind of reverse greenhouse effect. Instead of a build-up of carbon dioxide caused by today's burning of fossil fuels, a build-up of atmospheric oxygen was taking place. Without the warming effect of the carbon dioxide shield, the Earth may have cooled to icing, a common scientific speculation that Butterfield finds appealing.

Logically, not a lot of oxgyen would be freed, nor carbon buried, during such bleak times for life. Indeed, the occurrence of the ice ages and iron accumulations match Knoll's reading of occasional elevations

Scientists have long argued that multi-cellular animal life existed before the Cambrian period, which is most commonly associated with the Burgess Shale fauna discovered in the last century. Fossil evidence of metazoan (multi-cellular animal) life that predates the Precambrian/Cambrian boundary by at least 30 million years has been found. The animals, which lived about 580 million years ago, are collectively known as the Ediacaran fauna, named for the Ediacara Hills of Australia where the best-known specimens were found. They were simple creatures shaped like pancakes, fern fronds, flattened worms, and jellyfishes.

580 MILLION YEARS AGO

KNOLL HAS CREATED AN ELABORATE COMPUTER MODEL TO EXPLAIN THE RISE OF LIFE

and dips in the respective oxygen levels of the time.

Still another chemical clue to the puzzle of early life is found in the ratio of two isotopes of strontium. The ratio is a measure of the shifting positions of the Earth's crust, and therefore, indirectly, an indication of changing climates in this eventful period. It varies according to the rate of erosion of continents and the spreading of ocean ridges. When the hydrothermal activity associated with the spreading of ocean ridges is increased, the lighter isotope is abundant.

Not long before Ediacaran time, the proportion of this strontium isotope shoots up markedly. Intriguingly, the proportion was low about 850 million years ago, suggesting the breakup of a supercontinent. The isotope proportion comes back up to normal and above in the late Precambrian. That shift is further evidence that the Earth was beset with sea changes, in two senses of the words—climatic and physical.

Knoll and a colleague at the University of Michigan, James Walker, have begun to put all of these pieces of evidence into a computer model of how the changes in the biology, chemistry, and geology of the time of early animal life affected one another. Knoll's modelling effort has already brought up one potential snag.

Volcanic gases produced along with intense hydrothermal activity might have used up all the oxygen freed by the burial of once-living organisms beneath new sediment and shifting continental plates. Oxygen levels could even have dropped, not risen, as a result of this volcanic activity. Maybe, Knoll postulates, such a net decrease is what kept animals so tiny before Ediacaran time, 600 million years ago (if indeed they existed, since Butterfield's finds are yet to be confirmed).

As it happens, 600 million years ago is roughly the time that the serious hydrothermal action died down—the time when larger animals turned up with relative suddenness.

Knoll's model is an elaborate explanation for the rise of life. It's big-picture-painting of the sort that Nick Butterfield enjoys. As Butterfield says, "It's not just arm-waving, and it's not entirely a house of cards. It's built on some pretty good evidence and it's getting a lot of attention."

For his part, Knoll doesn't expect his design for living to go unquestioned. He fully expects his model to be modified, if not invalidated, by future findings. As Knoll himself concludes, his hypothesis is "not gospel... The rate at which my colleagues and I have been surprised by new findings about the Proterozoic world suggests that the fun is not over."

Until the discovery of the Ediacaran fauna, the Cambrian animals of the Burgess Shale, such as the trilobites pictured here, were the earliest soft-bodied animals known on Earth. As part of the Cambrian explosion of life, they lived about 520 million years ago, 80 million years after the Ediacaran fauna.

520 MILLION YEARS AGO

THE RINGED CROSSES OF THE CELTS

The Celtic ringed cross has a history that extends from the Middle Ages to present-day Canada

SHIRLEY ANN BROWN

FOR THE MOST PART, THE MODERN TRAVELLER WHO wishes to explore the remarkable beauty of the early Celtic crosses must become a rubber-booted pilgrim, take Peter Harbison's *Guide to the National Monuments of Ireland* in hand, and forsake the com-

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fort of museums. These crosses, with their characteristic rings, range in height from one to almost six metres, and are most often standing in their original locations, slowly mouldering in the elements.

Some are found in cemeteries, while others are in open fields amidst the grazing sheep and cows. Because of their size and the fact that they are free-standing monuments, they are called high crosses, or standing crosses, in order to distinguish them from the crosses used as liturgical items in churches.

The Celtic cross has a centuries-old history stretching back to the early Middle Ages. There are well over 100 of these stone monuments of early Christianity spread across Ireland, Scotland, northern England, and the offshore islands, with the majority in Ireland. The geographical distribution of the medieval Celtic cross is testimony to the cultural unity in the areas on both sides of the Irish Sea where the Celts had settled. By contrast, in the Anglo-Saxon parts of Great Britain, the non-ringed cross had been accepted in early medieval times as the recognized Christian monument.

Although it is known that the Celtic high crosses were associated with monasteries, it is not known exactly when and where they first appeared. There is a small number of references in late seventh-century writings that mention standing crosses in northern England and Scotland.

The chaotic history of the seventh century may cast some light on the early development of the Celtic monumental cross. This was a time when the Holy Land was not easily accessible to pilgrims. Jerusalem and the Shrine of the True Cross, favoured destinations of the Christian traveller, passed into the hands of the Moslems in 638. It wasn't until the last quarter of the seventh century that Christian passage to the Holy Land could be undertaken once more. Even then, the journey from the northern isles was long, dangerous, and expensive.

For those who could not participate in such a venture, the monumental stone crosses were mystical substitutes for the cross erected on Golgotha by Emperor Theodosius II in 417. They could serve as centres for local pilgrimage and as gathering places for prayer and worship.

Monumental crosses served a number of ancillary purposes in Ireland. Originally associated with monastic foundations in a country that had no towns until the tenth century, the crosses marked places of refuge and sanctuary. To the medieval mind these crosses shared the miraculous powers of the True Cross, and they assumed the function of warding off evil, both spiritual and physical, and later in the ninth and tenth centuries, of warding off the Viking enemy.

Additionally, they served as boundary markers to indicate the various parts of the monastic enclosure, and it was not unusual for as many as eight crosses to be erected around and about a monastery. When towns developed, market crosses indicated the intersections of the main roads. The crosses generally do not appear to have been created as burial markers; the cemeteries in which many of the crosses are now found grew up much later.

But none of this explains why the ring was attached to the cross-arms. The crosses are almost always monolithic and are set into a separate base. Since the rings are not a structural necessity, the reason for their adoption must be iconographic. Sources in the Middle East—Egypt and Armenia—have been suggested for the amalgamation of the cross and circle, with the motif being transported to Ireland along with the peculiar type of hermetic monasticism established on the island by St. Patrick and his successors in the late fifth century. However, there is not enough physical evidence to support this theory.

> The combination of the cross and ring may have symbolized the unifying triumph of Christ and Christianity in the seventh-century Celtic world

On the other hand, there was a long tradition of relating the cross and circle in Italian art, where the combination appears in painting, sculpture, and mosaic from the third century onwards. The circle seems to have developed from the wreath or garland of victory draped around the cross by the early Latin Christians so that the cross was interpreted as a symbol of triumph and resurrection rather than of death and defeat.

Another contributing motif was probably the combination of cross and cosmic globe, which appeared in mosaics in imperial Ravenna during the fifth and sixth centuries. This combination symbolized the universal and unifying triumph of Christ and Christianity throughout the Roman world, and reflected the idea that the Christian religion was the one force that could unify an empire comprising many different cultural entities. Such symbolism would have been particularly significant in the seventh-century Celtic world, which was divided among competing petty kingdoms and tribes.

A detail from the shaft of the south Ahenny cross shows that even after 1500 years, the ornate decoration of the Ahenny crosses is still crisp.

PHOTOGRAPHY BY SHIRLEY ANN BROWN

As the centuries passed, the original meaning of the ringed cross was lost and the form itself became synonymous with Celtic culture of the British Isles. It was the form and its decoration that were to have the lasting influence and that were recalled so vividly during the Celtic revival of the nineteenth century.

The Celtic high cross developed along two lines. In south-central Ireland, near the modern town of Kilkenny, there is a series of high crosses, which may very well be among the oldest. Within this group, the two crosses standing in a field at Ahenny are special because of their highly developed carved ornamentation. Raised up on fairly lofty bases in the shape of truncated pyramids, the crosses stand about 3.5 metres high. Archaeologists suspect that the odd-shaped stones atop these crosses were later additions to the monuments and that the original terminals have been lost.

Carved decoration on the Ahenny crosses is extraordinarily rich and varied. With the exception of the bases, all surfaces are covered with abstract ornament, still amazingly crisp and clear in definition after 1300 years. The four sides of the shafts are covered with rectangular panels exhibiting a veritable catalogue of Celtic ornament: spiral compositions terminating in birds' heads, single and multiple-cord interlace, fret patterns, geometric designs, and even one panel of interlacing human figures. The arcs of the rings are alive with interlace and scroll patterns, while skilfully executed band interlace of varying rhythm expands and contracts to fill the faces of the cross heads (the two arms of the horizontal crossing, or transom, and the head of the shaft). These designs must have been carefully worked out before they were carved because the complicated interlaces never become unravelled or uncertain. The bases are covered with figural relief sculpture, which has been badly eroded by time, and it is now impossible to discern the subject matter.

A large protruding boss, covered with spiral ornament, is placed in the central intersection, and four other bosses mark the junctions of the ring and the arms. All the main patterns found on the metalwork and in manuscript illumination associated with Irish foundations can be seen on the crosses.

Carved in local stone, the Ahenny crosses are deliberate approximations of decorated metal processional crosses. But it is their imitation of descriptions of the great cross on Golgotha that is most important. Like the majority of monumental crosses, the Ahenny crosses were situated so that their main faces look east and west, as did the Golgotha cross. To evoke the image of the Golgotha cross, which was sheathed in gold and encrusted with gems, the Celtic artist employed designs that appealed to indigenous taste—a true marriage of Christianity and pre-Christian Celtic culture.

The bases, which raise the crosses above ground level, are reminiscent of the Rock of Calvary, which had been carved into a cubic form in the fourth century by the Emperor Constantine. Constantine wanted the rock to fit into the shrine complex that he was building on the accepted site of Christ's crucifixion. Descriptions of the shrine confirm that it was approached by steps and that it was covered by a roof. This may explain the steps at the junction of the shaft and the base of the Irish crosses, and the desire to place a terminating cap on the top.

The second type of high cross identified with Ireland and Celtic culture is a somewhat later development. These are the so-called scripture crosses. Even larger and more numerous than the ornamentally decorated high crosses, they respond to a totally different aesthetic muse. Dating mostly from the mid-ninth to the eleventh century, they incorporate panels of narrative figural sculpture into their design along with the standard repertoire of Celtic ornament.

> The transition from abstract ornamentation to easily recognizable figures and readable narratives clearly indicates the objective of reaching an audience beyond the dedicated religious

Figures decorate the shaft of the Cross of Moone, possibly the earliest of the figured monumental crosses.

It wasn't until the advent of the scripture crosses, which appear in groups primarily throughout the eastern half of Ireland, that Celtic art truly embraced the naturalistic representation of the human form. Once this happened, there was an outpouring of narrative religious sculpture.

On the scripture crosses, the west arm almost invariably portrays the crucifixion of Christ, while the east arm presents either a Last Judgement or a Christ in Glory. These images of Christ are augmented by narrative scenes on the shaft. Primarily taken from the scriptures, both canonical and apocryphal, the list of chosen narratives is long, but can be organized into groups. The largest group includes Old Testament stories showing deliverance from danger through divine intervention. Popular choices included Daniel in the Lions' Den, Abraham and Isaac, David and Goliath, and the Three Youths in the Fiery Furnace.

Other narratives focused on the lives of Old Testament personalities who were interpreted as pre-

figuring Christ, notably David and Moses. The story of the Fall of Man was depicted through the images of Adam and Eve under the Tree and the murder of Abel by his brother, Cain. Another common subject was the events and miracles from the life of Christ. Portrayals of St. Peter with the keys to Heaven and St. Paul with the Book of the Law represented the authority of the Church. Two early hermit saints, Paul of Thebes and Anthony of Egypt, conveyed the monastic life as the ideal Christian existence.

Judging by the number of bases that still exist, there was a far greater number of sculpted figured crosses than the 35 remarkable monuments that still remain. Consistently facing east and west, they range in height up to almost seven metres, and like the ornamented crosses, they were associated with monastic settlements. Situated both inside and outside the actual monastic walls, sometimes in clusters, the crosses probably marked gathering places for some of the monastic offices and for communal devotions. Current scholarship is revealing that the choice and placement of subjects on the monuments was tied very closely to liturgical practice and prayers.

The Cross of Moone, somewhat more than five metres in height, stands in a churchyard in County Kildare. Unique in shape and style, it is the strangest and one of the most impressive of the figured crosses. If the late Françoise Henry, the doyenne of medieval Irish art history, was correct in her dating of the cross to the late eighth century, then it is the earliest of the figured monuments.

The Moone figures are represented in a disarmingly naive manner. The bodies consist of simple geometrical shapes with huge heads and large eyes. Some figures lack arms, while others gesticulate expressively. The figures may have acquired their modern appearance in part from the aesthetic considerations of the artist, and in part from the difficulties of carving granite.

While the great Cross of Moone may be considered somewhat experimental, the stylistically and iconographically related sandstone crosses at Kells, Durrow, Monasterboice, and Clonmacnoise are considered the epitome of the mature style.

There are two great sculpted crosses standing almost undamaged at Monasterboice, County Louth, northwest of Drogheda. Part of a third and evidence of at least four others have surfaced at the site. The best known of these monuments is the Cross of Muiredach, named after an inscription still partly legible on the shaft near the base. It is not certain whether this is a reference to Abbot Muiredach who died in 845 or to the abbot of the same name who died in 922.

Including the original house-shaped cap on top, the Cross of Muiredach stands about 5.5 metres high. The west arm displays the standard Celtic version of the crucifixion of Christ; the east arm is filled with the most complex depiction of the Last Judgement known to predate the erection of the great Romanesque tympana of twelfth-century France. Panels of Celtic decoration and thirteen narrative compositions cover the rest of the monument.

The transition from abstract ornamentation on the early crosses to the combination of easily recognizable figures and readable narratives on the scripture crosses clearly indicates the desire to reach out to an audience beyond the dedicated religious. Such a dramatic change of taste also represents a response to the development of narrative painting and sculpture in the art of the Carolingian Kingdom during the ninth century. Because many of the continental monasteries were Irish foundations, it follows that new ideas and artistic models would have been brought to Ireland by returning monks and visitors.

Canadians do not have to travel to Ireland or Britain to view magnificent Celtic crosses. They are among the most prominent forms in Canada's Christian cemeteries, where they are found either as free-standing markers or as carved design, ranging in size from small to very large. The cross may be plain and austere, or embellished with carved inscriptions and decoration. But whatever its size, proportion, or degree of ornamentation, the ring that connects the transom to the upright is the distinguishing element. By the late nineteenth century, the Scots and Irish settlers in Canada—Protestant and Catholic alike—had adopted this particular cross as their favoured identifying memorial.

The majority of Celtic crosses found in Canadian cemeteries imitate the decorated Celtic crosses, although there are some that were inspired by scripture crosses. They evoke the memory of the homeland that the Irish and Scots left behind when they came to settle the new land, and they attest to the lasting influence of the Celtic cultures upon Canadian life. ❦

> Celtic crosses in Canadian cemeteries evoke the memory of the homeland that the Irish and Scots left behind, and they attest to the lasting influence of Celtic culture upon Canadian life

This ornamentally designed Celtic cross is one of many to be found in Canadian cemeteries. Photo reproduced with permission of Mount Pleasant Cemetery, Toronto.

Eastern bluebirds, with their striking plumage and gentle disposition, have charmed birdwatchers for generations. However, their existence has been endangered by drastic changes to the environment, by competitors for nesting sites, and by parasitic blowflies. The bluebirds are listed as rare by the Ontario Ministry of Natural Resources.

PHOTOGRAPH COURTESY DR. W.A. CRICH

Bluebirds, Blowflies, and Parasitic Wasps

Scientific rather than emotional responses are needed to protect the diverse life on Earth

Christopher Darling and Julie Thomson-Delaney

Although 70 per cent of all described animal and plant species are found in a narrow belt around the equator, you do not have to venture into areas of pristine tropical forest to find and study new species or to discover the remarkably complex interactions between species. This can often be accomplished in your own backyard if you look closely at the smaller forms of life.

If nothing else, biodiversity concerns insects, and to a lesser extent, flowering plants. Of the 1.4 million species known to science, about 750,000 are insects and about 250,000 are flowering plants. Current estimates place the number of species inhabiting the planet at somewhere between 5 and 30 million, a degree of uncertainty that is sad testimony to a lack of basic understanding of the world around us. And as the exploration of biodiversity continues, the representation of insects will increase dramatically. Today, it is rare to add to the register of approximately 9000 species of birds, but the discovery of new insect species is commonplace in North America.

It is important to realize that the multitude of insect species is not one of nature's follies. Each species functions as an integral part of biological communities. But because of the small size of most insects, their roles are unappreciated if even contemplated. It is rather ironic that the survival of the orangutan in Sumatra and Borneo may be dependent upon species of tiny wasps, each specimen less than a millimetre in length. Why? Because wasp pollinators are essential to the fig crop, and figs are a major food source for orangutans. It is also ironic that the health and welfare of the eastern bluebird, one of the most cherished species of songbird in North America, is intertwined with the furtive ways of another species of minute wasp.

Bluebirds, with their striking plumage and gentle disposition, have charmed birdwatchers for generations. But populations have declined by as much as 90 per cent over the past 50 years and the species is currently designated as rare by the Ontario Ministry of Natural Resources. Their decline has caused not only a public outcry but the establishment of legions of devotees determined to revive the species. The reasons for the decline in numbers are undoubtedly complex but most certainly relate to human manipulation of both the physical and biological environment.

Bluebirds build their nests in preformed cavities such as holes in dead trees. Intense competition for nesting sites is considered to be one of the major factors limiting population size. Another cavity nester, the house, or English, sparrow, was introduced into North America in 1851. The great growth of the sparrow population, together with the clearing and management of wood lots, is thought to be a major contributor to the plight of the bluebird. An obvious solution to

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what appeared to be a straightforward problem was the provision of more nest sites, but like so many other quick-fix solutions that come from rapid assessments, it failed to take into account both the diversity and complexity of ecological interactions.

Clubs and societies were established and thousands of nest boxes were set up in fields and windrows to provide suitable nesting sites. (The Canadian record may well belong to Henry Metke, who singlehandedly built and established more than 1000 nestboxes in and around Kelowna, British Columbia.) The nest boxes were designed with entrance holes of a size meant to discourage other tenants. In addition, regular "trap lines" of nest boxes were established so that the boxes could be easily checked for squatters, especially the dreaded house sparrows, which, when found, were unceremoniously evicted. The growth and development of the baby birds were frequently monitored. However, this hands-on approach soon revealed another competitor, one that would not be so easily dispatched.

English sparrows, introduced to North America in 1851, compete for nesting sites with the bluebirds. An English sparrow built its nest on top of a bluebird nest in this nesting box.

Much to their horror, bluebird managers would often find large grublike parasites attached to the nestlings, or large numbers of fly maggots in unsuccessful nests. These maggots were the immature stages of *Protocalliphora*, a highly specialized group of blowflies that feed exclusively on the blood of birds. Like many parasites, these usually do minimal damage to healthy hosts, but death of the nestlings has been reported in times of food shortage or if the parasite load in a given nest is extremely high.

Needless to say, the existence of these blood-sucking parasites elicited an immediate and expected response: they must be eliminated. But as the history of attempts to eradicate insect pests has shown, this would not be an easy task. Insect populations are remarkably resilient. Nevertheless, the first reaction was to call out the chemical artillery.

War was to be waged on the blowflies, but this gut response was tempered by the increased awareness of the effect of insecticides on vertebrates—in this case the bluebirds. A safe insecticide had to be found. Rotenone-based flea powders were soon selected and the painstaking task of dusting the nestlings began.

There were major problems with this approach. In practice, only specific bluebird nests could be treated, and although individual nestlings may have benefitted from this attention, nothing was done to limit blowfly populations in natural nest sites or in unmonitored nest boxes. This completely reactive approach also did not address the cause of the problem, the resident population of blowflies. The approach was conceived in the total absence of information about the biology of blowflies. A wiser reaction would have been to conduct detailed biological studies to evaluate the situation and to formulate an appropriate management plan.

For years it has been known that many species of flies, including *Protocalliphora*, are attacked and killed by parasitic wasps. Most species of wasps attack while the flies are in the vulnerable pupal or resting stage, between the maggot and adult stages. Species of *Nasonia* are the most commonly encountered. With their brilliant iridescent metallic colours, these very small insects (approximately three millimetres in length) are aptly named "jewel wasps."

The females locate the host, drill a hole through the tough outer covering of the pupa, paralyze it, and then lay eggs on the surface of the developing fly. The eggs hatch and the voracious wasp larvae quickly consume the host, then pupate themselves inside the protective pupal case. When development is complete, a new generation of jewel wasps emerges from the pupae, mates, and begins the cy-

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cle anew. Development is very rapid and the generation time can be as short as 10 days during the dog days of summer. The parasites are gregarious and many wasps, a preponderance of them females, emerge from a single host. The fall generation of wasp larvae enters a diapause, or a hibernation-like state, and overwinters within the blowfly pupal case.

But what species, if any, of parasitic wasps are present in natural nests and in nest boxes? Do these wasps control blowfly populations? Are bluebirds more heavily parasitized by blowflies in nest boxes or in natural nests? These were important questions because it was certain that the insecticide dusting procedure would also kill parasitic wasps, removing them as potential checks and balances of blowflies.

To answer these questions a biological study was initiated by the ROM's Department of Entomology. Its purpose was to gather as much natural history information as possible concerning the biological community of bluebirds, blowflies, and parasitic wasps. This was facilitated by a collaboration with Dr. Raleigh Robertson of Queen's University, whose long-term studies of bird ecology are conducted at the university's biology station in Chaffey's Locks, Ontario. Extensive grids of nest boxes have been established for studies of the reproductive biology of tree swallows and bluebirds, which provide important ecological information on blowflies and jewel wasps. The approach in the first year of study was to collect the contents of nest boxes in the late summer, after the birds had fledged, and to look for evidence of blowfly infestation.

Extensive grids of nest boxes have been established in fields for studies of the reproductive biology of tree swallows and bluebirds, which provide important ecological information on blowflies and jewel wasps.

Many empty blowfly puparia were found, an indication that the flies had completed their life cycle and had left the nest box to overwinter in the leaf litter or some other protected sites. But closer examination revealed that some of the puparia were not actually empty but were, instead, filled with many small larvae. These pupae were brought back to the Museum and after a couple of months in the refrigerator—a simulation of a rather brief and mild winter—were allowed to continue their normal course of development. Most of these puparia gave rise to jewel wasps of the genus *Nasonia*. Although this is one of the most commonly collected and studied species of parasitic wasp in the world, virtually all studies have been confined to the laboratory and very little is known about the role of *Nasonia* in nature, or of its effect on blowfly populations.

With our preliminary data we approached World Wildlife Fund Canada. This led to financial support from the Endangered Species Recovery Fund to conduct the background studies needed for developing an integrated blowfly management plan. Thanks to their generosity, field studies were initiated during the spring and summer months of 1988 and 1989 to examine the ecological interactions of blowflies and *Nasonia* and to determine whether it would be possible to manipulate the relationship in the bluebird's favour.

Bluebirds can produce two broods of young in a season and our first important piece of information was that the spring and summer nests are not equally parasitized by blowflies and parasitic wasps. There is a preponderance of blowflies in the spring. Ninety per cent of all nests contain blowflies and more than 150 blowfly maggots can be found in a single nest. However, the infestation rate by

blowflies increases only slightly as the bluebird breeding season progresses.

Populations of *Nasonia*, on the other hand, seem to build slowly throughout the season. Only about half of spring bluebird nests with blowflies contain wasps, and only about two per cent of the blowfly pupae are parasitized. The situation is very different by July, when virtually all nests with blowflies are parasitized by *Nasonia* and about 60 per cent of the blowfly pupae are killed by parasitic wasps. Blowflies do better in the spring and the jewel wasps do better in the summer, which suggests that the ability to overwinter may be an important factor in the ecological dynamics of the system.

By late summer blowflies have emerged from all the unparasitized pupae, and they overwinter as adult flies, most likely in the leaf litter. But parasitized blowfly pupae, each containing dozens of *Nasonia* larvae, remain in the nest. The *Nasonia* larvae spend the winter months in the blowfly puparium and resume development the following spring. One explanation for the different seasonal patterns exhibited by the blowflies and the wasps is that the wasp larvae experience high levels of mortality during the winter, resulting in the low numbers found during the spring.

Developing extensive conservation strategies for the rainforests without a thorough knowledge of the species that live there and their interrelationships could cause more harm than good

There is one aspect of nest box management that perhaps works against successful overwintering by the jewel wasps. Many managers routinely clean out their nest boxes in the fall, sprucing up the digs for next year's returning bluebirds. The used nesting material is either discarded or swept onto the ground, a practise that destroys the *Nasonia* larvae that would normally overwinter in the blowfly pupae. Unfortunately the *Nasonia* population that has been built up from its humble beginnings in the spring is decimated by this practice, and so there are fewer wasps for the next year's assault against the blowflies.

There does appear to be one way to improve bluebird nest boxes. Hardware cloth platforms installed beneath the nesting materials reduce not only the level of blowfly infestations (from 87 to 32 per cent of nests) but also increases the percentage of blowflies in a nest that are killed by *Nasonia* (from 28 to 69 per cent). Why this happens is unclear; it is not known if it is the result of changes in attack rates or of the survival rates of the blowflies and parasitic wasps.

One of the most exciting aspects of this research was the discovery of two new species of *Nasonia* from North America. One species comes from the east and the other from the west. Both have been collected only from birds' nests and appear to be exclusively parasites of *Protocalliphora* blowflies.

The behavioural interactions of these species of *Nasonia* are extremely complex and are virtually unexplored. What is known is that the species have very different life histories, but both can be reared out of the same blowfly puparium. When more fully understood, these additional species will provide new biological agents that can play a part in the management plan for bluebirds.

What can be learned from such a study? First, unexplored biodiversity is everywhere, even in the fields and hedgerows of southern Ontario, and that biodiversity is crucial for sustaining life. Second, biodiversity involves more than names and data in museum collections, databases, catalogues, and checklists. The world is an interacting network of species and processes, many of which are yet to be discovered, and most of which are yet to be understood. Finally, it is not surprising that many of our attempts to manipulate systems that we do not fully understand do more harm than good. If we cannot effectively manipulate populations of a few species confined to nest boxes, then what hope is there for developing effective conservation strategies or a sustainable means of utilizing rainforests, the most complex ecosystems on Earth? To attempt to perform such tasks without a full understanding of what species exist in the environment and how they interrelate is arrogance of epic proportion. ❦

The National Palace Museum in Taipei is the home of the world's most comprehensive collection of Chinese art and antiquities.

The National Palace Museum of Taipei

FEW VISITORS TO *CIRCA 1492*, THE exhibition organized by the National Gallery of Art in Washington, saw the show as an important diplomatic breakthrough. But that's precisely how it was viewed by officials in Taipei and Beijing. For this was the first time that objects from the National Palace Museum in the Republic of China were shown together with ones from the National Palace Museum in the People's Republic of China. In the world of Pacific Rim politics, this was heady stuff indeed. That aside, it was also no doubt good business for the museum in Taipei—the less visited but more remarkable of the two opposing institutions.

In curatorial circles, the National Palace Museum in Taipei has long been considered the home of the most comprehensive collection of Chinese art and antiquities and indeed one of the world's most important museums. Its public profile, however, has never matched its professional reputation. Maybe this is because it is, in one sense, so new. The collection has its origins in the Sung dynasty (960-1279), but the present building, in the Shihlin district on the north side of Taipei, dates only from 1965. Boyle Huang was the architect; he is now a Chinese-art consultant in Toronto.

The museum was long thought to house an extraordinary 700,000 items, but the official total keeps growing, thanks not only to purchases and donations but to a new inventory that is still in progress; at present the figure stands at 760,000. The most extensive holdings are in the areas of porcelain, ceramics, ritual bronzes, and painting and calligraphy, but the mandate extends to collections of jade, enamel ware, lacquerware, and rare books and manuscripts, which are all far more than simply representative.

Collecting began through the efforts of the Sung emperor T'ai-tzu and was carried on by his successors down through the centuries until artistic treasure filled the display rooms and storerooms of the capital. For most of this period, this meant Beijing's Forbidden City, where none but members of the court and royal household ever saw the collection. That it was maintained throughout various wars and upheavals is little short of miraculous. With the collapse of the Qing dynasty in 1911, gathering came to an end, but the new Chinese republic opened the hoard to the public. After 1925, when P'u-yi, the last em-

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peror, was banished, the authorities began cataloguing the treasures as well, and designated the spot where they were kept as the National Palace Museum. But that was only the beginning of the incredible story of the collection's survival.

When the Japanese invaded Manchuria in 1931, the collection was moved south to Shanghai for safe-keeping. Then it had to be moved again—this time to Nanjing. When the Japanese occupation became an actual Sino-Japanese war in 1937, most of the objects were hidden in three widely scattered locations as far away as Sichuan, more than 1600 km up the Yangtze River. One lot of 7000 crates was removed from a building in Hunan Province only one day before the site was destroyed. The last survivor of this heroic preservation effort is Na Chiliang, now 85. He lives for free in a house at the rear of the museum grounds, a national hero.

The treasure had to remain hidden for years, as the Sino-Japanese conflict blended into the Second World War. After the peace in 1945, the government of Chiang Kai-shek reassembled all the old imperial collections in one place: Nanjing, the Nationalist capital. When, in a few years, it became clear that the Communists under Mao Zedong might overrun Nanjing, most of the pieces, including all the choicest ones, were removed from the Mainland and taken offshore to Taiwan, which the Japanese had been forced to return to China following the war.

The pieces were kept in Taichung before facilities were ready in Taipei, where the Nationalists carried on business as the Republic of China. For its part, the People's Republic opened its own National Palace Museum in the now sparsely endowed Forbidden City (as well as establishing other brand-new institutions, particularly the formidable Shanghai Museum of Art, which opened in 1952). Thus there came to be two National Palace Museums—unwitting symbols of the two governments, each of which claimed to be

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the legitimate government of China.

The Taipei museum is immense, with display areas and offices to talling 8300 *ping* (27,870 square metres) and employing 600 people. Of course, only a small portion of the vast collections, between 7000 and 9000 items, can be shown at any one time. So there is a large permanent exhibit, *The Relationship Between Chinese and World Culture,* on the ground floor, to give visitors an overview and provide necessary groundwork for the various other displays, such as paintings (changed every three months) or ceramics (changed every one to three years). There are naturally many famous works by famous individual artists and craftspeople: virtually all the greatest names in the history of Chinese calligraphy are represented, for instance. But I found, as I imagine many visitors do, that I came away with the most vivid memories of some of the smallest and least-touted objects.

In an enormous reception room, as per Chinese practice, I had a formal interview with the deputy director, Peter Chang, who told me of the museum's ambitious outreach program, the construction of its new library, and its eager solicitation of private donations to augment the imperial collection. "Collectors in the Republic of China may donate as a way of enjoying tax deductions, especially with regards to inheritance tax," he explained. "But there are many donors from outside Taiwan—most recently, Japanese."

I summoned my nerve to ask whether the *Circa 1492* exhibit in the United States might lead one day to direct exchanges between the two National Palace Museums in the two Chinas. That sent the translator and aides into a flurry of consultation. Finally, back came the answer: "Discussions about that possibility have only begun, and there has been no actual contact with Beijing."

DOUGLAS FETHERLING
Douglas Fetherling is literary editor of the Kingston Whig-Standard

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⚜ Book Reviews ⚜

Stolen Continents, Whale Light, and more...

Last year, as my small part in the observance of the 500th anniversary of his first transatlantic voyage, I reviewed more books about Christopher Columbus than any person should be forced to read, even in a very long lifetime. A precious few of them were actually quite worthwhile, even if a too simple-minded revisionism led them to depict Columbus as pure evil and the aboriginal people he exploited as the apotheosis of virtue. But none of last year's crop achieved the balance and insight of Ronald Wright's new book **Stolen Continents: The Americas through Indian Eyes since 1492** (Penguin, $29.99). All of the texts that came my way during the quincentenary were the work of white people. For all their shame at what their European ancestors did, however, they did not think to undertake what Wright (also white—a Canadian from Britain) has done: to draw on the natives' own accounts to tell the story of European-native contact.

The reason, in most cases, is that the white writers didn't know the material existed. From the first generation down to the present, Wright argues, whites have passed along various assumptions about the indigenous peoples, among them the idea that they have left little literature about themselves. In fact, many of the Mesoamerican societies, for instance, are well documented from within—even after the Spanish destroyed so many archives. The field is rich with works such as, for example, the *Codex Mendoza*, an Aztec record compiled about 1541 (and just published in a four-volume facsimile by the University of California Press at US $594).

Other stubborn impressions are that the native population was always quite small, not "advanced," and not usually very complicated in its social organization. In fact, the population of the Americas in 1492 was probably 100 million, one-fifth of Earth's total at the time, but was decimated from the 1530s onwards by the pandemic of smallpox and later other diseases the Europeans introduced ("biological weapons," the author says). In the thirteenth century, the city of Cahokia, near modern St. Louis, had 40,000 people, making it as big as Paris or London at the time. One Maya city covered three times the area of Rome; one of its temples remained the tallest building in the New World until completion of the United States Capitol dome in 1865. Other societies in the New World were renowned for their paved roads or their achievement in mathematics, for example. *Stolen Continents* is full of such facts. As for native social structures and systems of government, they varied from empires to decentralized federations but were always highly evolved if only in their beautiful simplicity. Beyond that it's impossible to generalize except to say, as Wright does, that "Indian nations, like modern ones, were ethnically fluid and complex; the homogeneous 'tribe' of popular imagination seldom existed."

Wright, who lectured at the ROM earlier this year, takes five cases and studies them in depth. He shows how the native societies were swamped by Europeans but fought back and, with various degrees of success, persisted or at least survived. The five are the Aztecs (of Mexico and Central America), the Maya (of the Yucatan Peninsula and elsewhere), the Incas (of Peru but also of Belize, Bolivia, and parts of Chile and Argentina), the Cherokee (driven to the American West

from their original homeland in Florida and the Carolinas), and finally the Iroquois (of Quebec, Ontario, and the adjacent part of the United States).

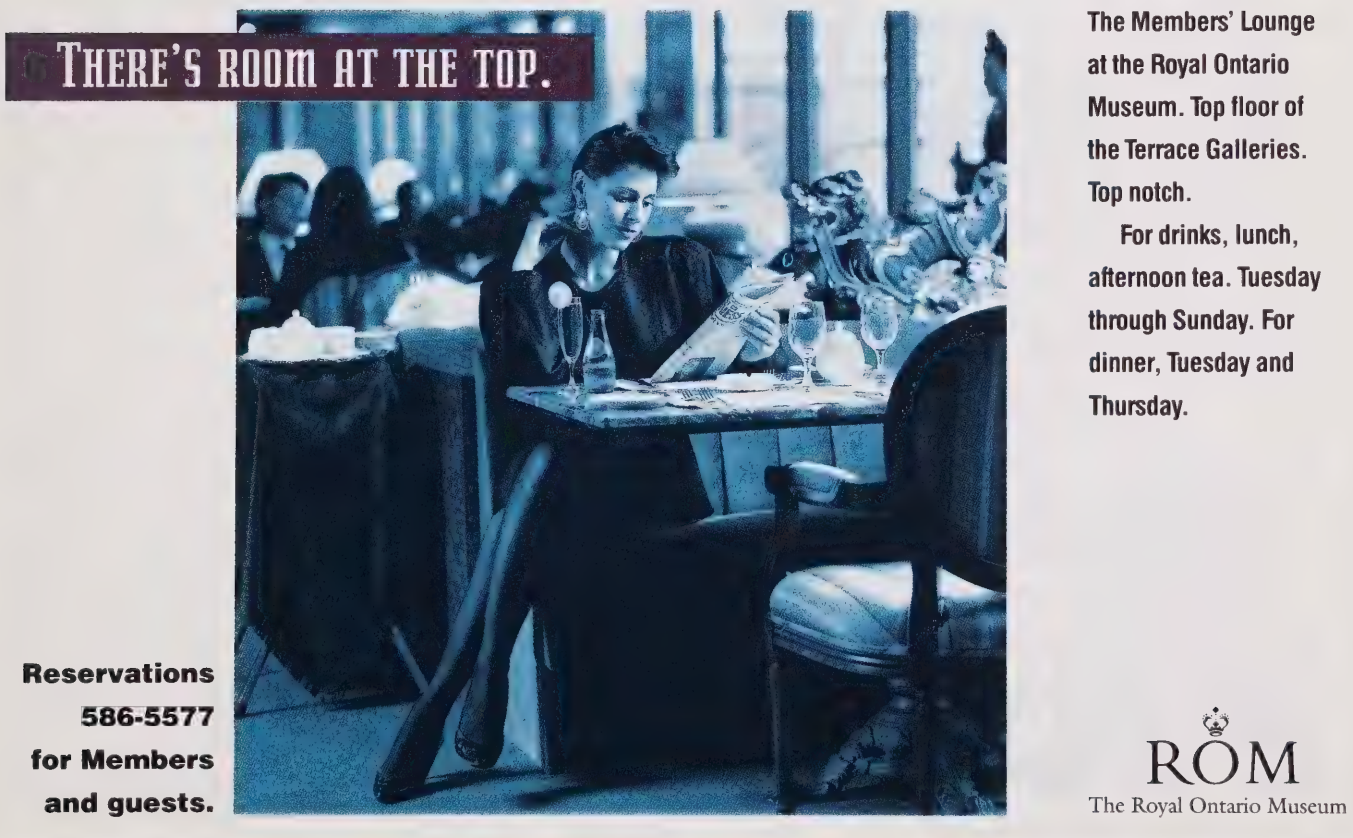
Wright's own special empathy is with the second and third of these groups; he has expressed it previously in his books *Time Among the Maya*, which won particularly high praise, and *Journey in Peru*. But by his even-handedness, and his use of native texts, whether written or visual, to compare different versions of the initial conflicts, he manages a fresh perspective. This is true even on the parts most familiar to Canadian readers (the remarkable Iroquois gift for diplomacy). In general, the book is rife with fascinating linkages and connections, such as the extent to which the example of the Cherokee federation influenced the founders of the American republic. The Americans subsequently set about, as early as 1808, to destroy the very model they had worked from.

"All five peoples in this book have resisted successfully to the degree that they are all survivors," the author writes. Some of the descendants live in peaceful obscurity on the margins of the dominant culture; others, such as the Shining Path guerrillas of Peru, have found new ways of seeking redress. Wright visited many of the sites described in the text and also talked with a number of native leaders. Generally speaking, he is more rewarding as a historian than as a reporter.

In the last analysis, he juxtaposes two views of life that could not coexist. He quotes Sitting Bull on the whites of America: "The love of possession is a disease with them. They take tithes from the poor and weak to support the rich who rule. They claim this mother of ours, the earth, for their own and fence their neighbors away." Wright adds: "If America had been twice the size it is, there still would not have been enough; the Indians would still have been dispossessed."

Whatever hope he finds in the situation is relatively small and, by coincidence, I think, rather than by choice, tends to reside in the Iroquois. With a population of 60,000—25 per cent of them Mohawk and 80 per cent of those in Canada—the Iroquois are now more numerous than they've been for three and a half centuries, and the so-called siege at Oka was some kind of turning point in the process of due recognition. In 1990, Wright points out, Canadian politicians "still spoke of the two founding peoples, English and French; within a year that myth was dead."

WITH HER LAST BOOK, *A Natural History of the Senses* (1990), Diane Ackerman, an American poet and now a staff writer at *The New Yorker*, had an even greater critical success than Ronald Wright did with *Time Among the Maya*. But her follow-through, **The Moon by Whale Light** (Random House, $26.50), is less impressive because it's more diffuse. Here, in expanded form, are her magazine articles about (to quote part of her subtitle) "bats, penguins, crocodilians, and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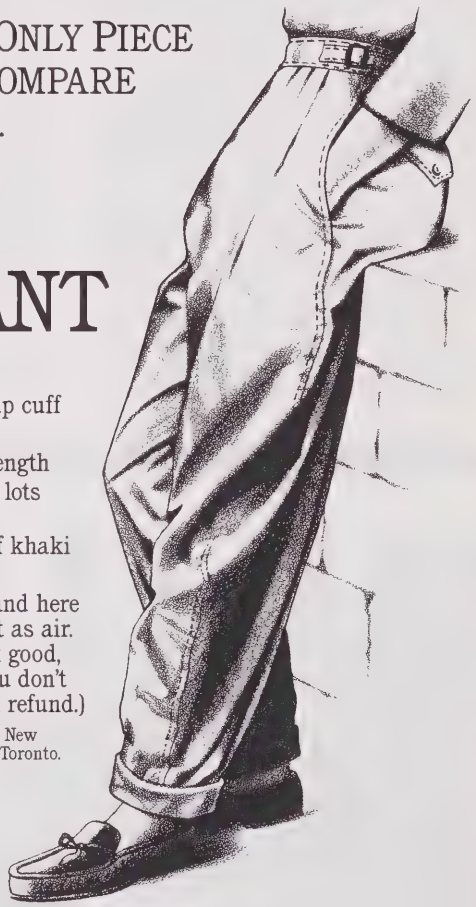

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whales." She has Wright's love of intrinsically interesting facts but not his underlying seriousness of purpose. One reads her, instead, for the enthusiasm and stylishness of her prose. She writes best about penguins, perhaps because of all her subjects, they are the ones that most resemble humans and she is a champion anthropomorphizer. Penguins, she writes, like to stand around in groups, looking like "the linoleum in a cheap diner" and exercising their gift of the gab. Her bats seem less attractive, all "fur and appetite" and highly strung, while the easy-going alligators lie in the water seeming to enjoy some "private chuckle" as their mouths assume "a crumbled smile and the eyes half close in a sleepy sort of way..." But she's no Ernest Seton Thompson with literary talent. There's a lot of palatable grown-up science here.

Stolen Continents and to a lesser extent *The Moon by Whale Light* are the kind of books that get the publicity they deserve. Here are some other new works of interest to *Rotunda* readers that you're far less likely to hear about elsewhere.

• **Uncommon Waters** edited by Holly Martin (Raincoast, $19.50 paper) claims to be the first-ever anthology of women's writings about fishing. Why it has taken so long for such an anthology to appear is puzzling. The earliest-known fishing essay, "The Treatise of Fishing with an Angle," was written in the fifteenth century and is attributed to Dame Juliana Berners, a reputed nun. One organization of female anglers in the United States has 26,000 members, and the editor of the magazine *American Fly Fisher* is Margot Page. Martin contributes a feisty introduction to this diverse assortment of poems, short stories, memoirs, and articles, by people ranging from Margaret Atwood and Tess Gallagher down to non-professional writers who just had to express themselves on the subject. In terms of sport and geography, the range is wide, but a number of

the contributors have Canadian associations, whether by residence or fishing experience.

• **The Oxford Companion to Gardens** by Geoffrey and Susan Jellicoe, Patrick Goode, and Michael Lancaster (Oxford University Press) first appeared at prohibitive cost in 1986 and now returns as a fat, square, affordable paperback ($34.95). It is in the grand tradition of the Oxford Companions to various arts, disciplines, and branches of science: an imposing amount of historical and current information brought to bear on a deceptively vast subject by a surprisingly small band of people. In addition, this one has hundreds of plates and other illustrations. The emphasis is naturally on formal gardens in the European tradition and the European notion of the garden as an art form, but every effort is made to include other cultures as well.

• Readers of this column know that while I believe most so-called coffee-table books to be junk I'm always searching for ones in which the format serves a useful function beyond simply filling the bookshops with literary furniture. I've found another one: **The Natural History of the Universe** (Doubleday, $45) by Colin A. Ronan, the British astronomer and science-explainer. As astronomy has increasingly turned into physics, most people are finding it more difficult to understand. This thoroughly illustrated and brightly coloured survey of the subject uses different types of graphics most effectively to complement the text, which communicates complicated ideas without talking down to the reader.

• **Sierra Club: 100 Years of Protecting Nature** by Tom Turner (Prentice Hall, $65) is full of the first-class nature photography for which the American environmental organization has been famous. But the text about the history of the group is more revealing. The Sierra Club was founded by the Scots-born naturalist John Muir (1838-1914) mainly as a means of having Yosemite in California set aside as a public park. Since then the story of the Sierra Club has been one of slick PR and expert lobbying.

• Books about craftspeople often suffer from folksiness, a sign that craft, even at its highest, is not often accorded the same social and intellectual status as even the wide middle-ground of fine art. **Warren MacKenzie: An American Potter** (Fitzhenry & Whiteside, $84.50) is almost an exception. The esteemed and influential American potter, once a student under Bernard Leach in Britain and now a senior figure himself, isn't subjected to full art-historical treatment in David Lewis's text. But MacKenzie is given coverage that goes beyond the journalistic and the anecdotal. The biographical essay is a proper counterpart to the photographs by Peter Lee, which quite correctly place the work first but without ignoring our desire for glimpses inside the studio.

• A recent article by the real estate reporter of *The Financial Times* of London dealt with the question of how ghosts in old houses affect the selling price of those properties in times of recession. The bottom line was that ghosts are in this respect the opposite of kitchens and bathrooms: the older they are, the more they enhance the value—the newer they are, the more they detract from it. I dug out the clipping again when reading **Britain's Haunted Heritage** by J. A. Brooks (Fitzhenry & Whiteside, $42.95), a work compiled for the British Tourist Authority but by no means a mere promotional effort. Brooks is a serious writer on occult history and folklore, and he methodically travels the kingdom by region and town, compiling and classifying information about supposedly haunted buildings, public and private. He covers about 250 in all, and assembles a rich bank of archival images to accompany contemporary photographs of them. This is a more useful book than its title makes it sound.

Douglas Fetherling is literary editor of the Kingston Whig-Standard

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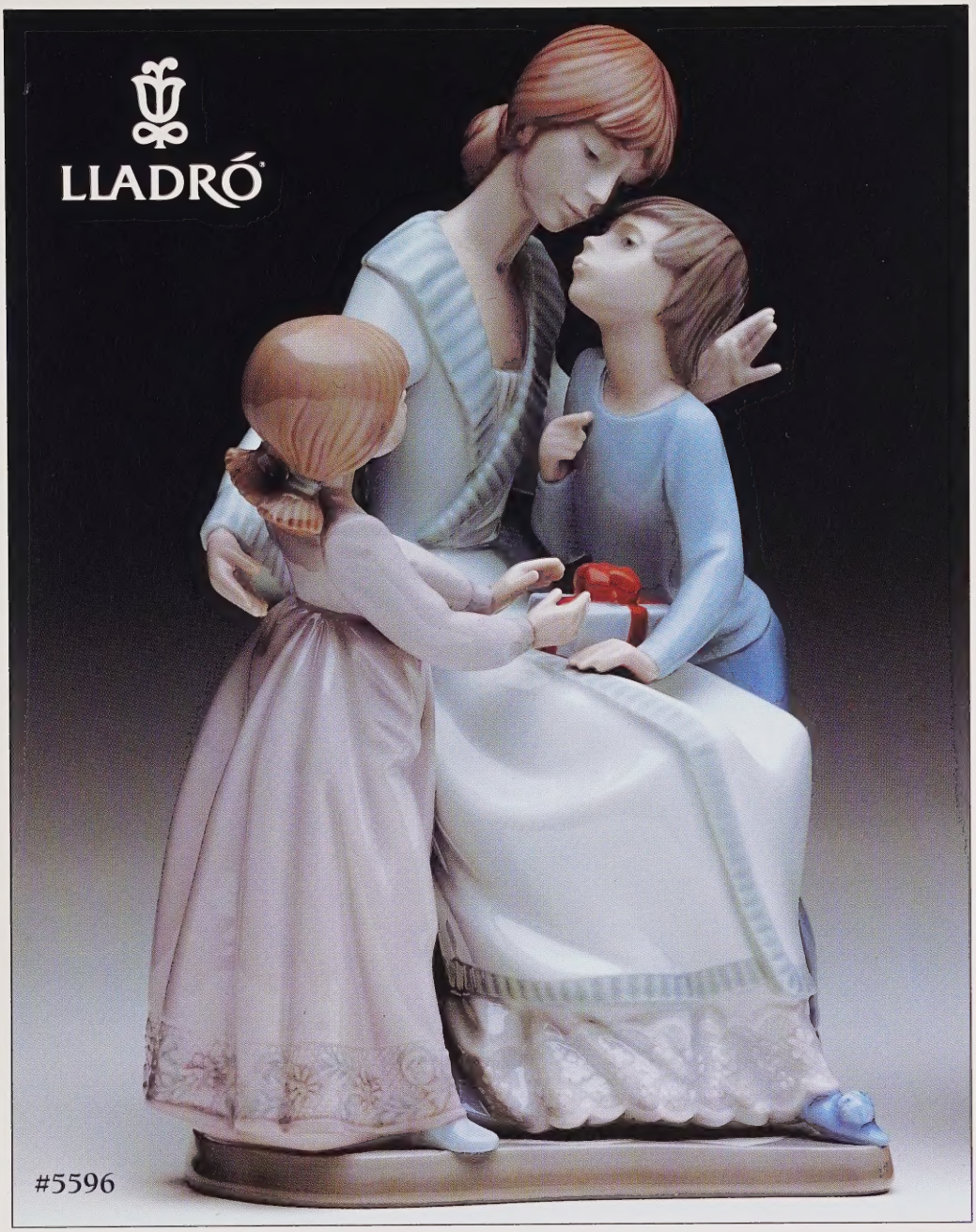

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